

Correlations Among Winter Finch Numbers at Ottawa, 1958–1983

by
Alex Mills

In Ontario, winter finches comprise nine seed-eating species: Evening Grosbeak (*Coccothraustes vespertina*), Pine Grosbeak (*Pinicola enucleator*), Purple Finch (*Carpodacus purpureus*), Hoary Redpoll (*Carduelis hornemanni*), Common Redpoll (*C. flammea*), Pine Siskin (*C. pinus*), American Goldfinch (*C. tristis*), Red Crossbill (*Loxia curvirostra*), and White-winged Crossbill (*L. leucoptera*). All but the Purple Finch and the American Goldfinch are typically northern breeders in eastern North America, summering in the coniferous forests and even beyond in the case of the redpolls. Winter numbers of Purple Finches and goldfinches in the south vary each year, and the numbers of the grosbeaks and northern *Carduelis* finches can vary dramatically. Crossbills, of course, are famous for their sporadic irruptions.

People have been trying to determine the factors governing the irregular patterns of occurrence of winter birds for some time. It is generally agreed that irruptions are dependent on high numbers of birds and poor food crops (Bock and Lepthien 1976), but knowing these factors does not seem to

allow accurate predictions of what sort of winter it will be. The formula for estimating the timing of flights is even more elusive. In some years redpolls arrive in numbers in southern Ontario by early November, while in others they do not appear until March.

After the spectacular numbers of Purple Finches, Pine Siskins, and both crossbills in the winter of 1984–85, I found myself wondering about the synchrony of winter finch flights in Ontario. To what extent do large numbers of one species coincide with either large or small numbers of another?

To find out, I assembled data from the Ottawa-Hull Christmas Bird Counts for the period 1958–83 (published in *Audubon Field Notes* and *American Birds*). Ottawa was chosen because it receives thorough coverage, because it often has good finch numbers, and because it is essentially at the north-south interface that extends along the south edge of the shield. Freedman and Riley (1980) have shown that some winter finch species have established “modern” population levels only since the mid- to late 1950s, and so I selected the period beginning in 1958.

Alex Mills, 1007–27 Cardigan St., Guelph, Ontario N1H 7V6

For each species for each year, I determined numbers of individuals counted per party hour, as recommended by Bock and Smith (1971). I then looked at each species pairing (36 in all) and calculated the extent to which the numbers for each pairing varied together. I did this by using correlation analysis, as described in most statistical texts (e.g., Sokal 1973). In short, coefficients of determination derived from the analysis and indicated as percentages reveal to what extent high numbers of one species correlate with either high or low numbers of another.

Following standard statistical procedures, any percentage less than 15.1 is not considered significant. Using this value, only seven of the 36 pairings were significant. The results for the seven are presented in Table 1. The numbers indicate the strengths of the relationships and the +/- signs indicate whether the relationships are positive (high numbers of one species coinciding with high numbers of the other) or

negative (high numbers of one species coinciding with low numbers of the other). Thus, for example, Hoary Redpoll and Common Redpoll show a strong positive relationship while Evening Grosbeak and Purple Finch show a moderate negative one.

For the most part, the significant results make sense. Goldfinches and Purple Finches, the two species that regularly breed in both the south and the north, correlate positively with each other and negatively with Evening Grosbeaks, a more exclusively northern breeder. Evening Grosbeaks also correlate positively with Pine Grosbeaks and Common Redpolls, two other northern species, and the Hoary Redpoll-Common Redpoll correlation is certainly no surprise. The only perplexing result is the positive Purple Finch-Red Crossbill correlation; winters of large numbers of Purple Finches at Ottawa have also tended to be winters of large numbers of Red Crossbills. That 29 of the 36 pairings (including all those of Pine Siskin and White-winged

Table 1. Significant correlations among winter finch numbers based on Ottawa-Hull CBC data, 1958-1983. All other species pairings (29 in number) had percentages of less than 15.1, making them statistically non-significant.

SPECIES PAIRING	STRENGTH OF RELATIONSHIP AS AS PERCENTAGE	
	+/-	
Evening Grosbeak — Pine Grosbeak	+	23.6
Evening Grosbeak — Purple Finch	-	21.3
Evening Grosbeak — Common Redpoll	+	22.6
Evening Grosbeak — American Goldfinch	-	24.0
Purple Finch — American Goldfinch	+	24.4
Purple Finch — Red Crossbill	+	20.9
Common Redpoll — Hoary Redpoll	+	48.7

Crossbill) reveal strict independence indicates considerable autonomy of response to the factors that determine movements.

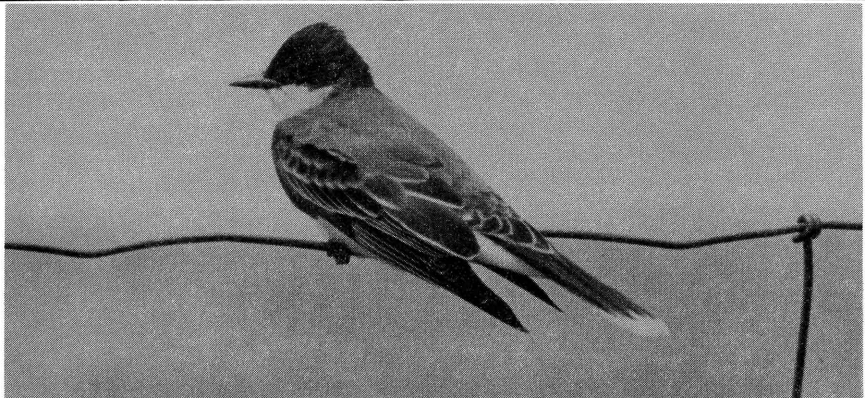
This method of analysis is subject to some of the problems encountered in other CBC data studies. Weather factors and accuracy of identification and enumeration are two obvious ones. Parker (1973) clearly showed that Pine Grosbeaks moved through southern Ontario over the duration of the 1971 CBC period; obviously, the date of each 1971 count in southern Ontario influenced the Pine Grosbeak tally. This leads me to acknowledge that what is true in late December may be very different from what is true in, for instance, late February. Perhaps my results can be applied no further than Ottawa for the period used!

Lack (1954) claimed that different species irrupted independently of each other. Bock and Smith (1971) plainly showed, however, that Colorado populations of Red-breasted Nuthatches (*Sitta canadensis*) and Red

Crossbills cycled together. Their data, and the data presented here, suggest that Lack's claim is not always true.

Literature Cited

- Bock, C.E. and L.W. Lephien. 1976. Synchronous eruptions of boreal seed-eating birds. *Amer. Nat.* 110:559-571.
- Bock, C.E. and R.B. Smith. 1971. An analysis of Colorado Christmas Counts. *Amer. Birds* 25:945-947.
- Freedman, B. and J.L. Riley. 1980. Population trends of various species of birds wintering in southern Ontario. *Ont. Field Biol.* 34:49-79.
- Lack, D. 1954. The natural regulation of animal numbers. Clarendon, Oxford. 343 pp.
- Parker, M. 1973. Influx of Pine Grosbeaks into southern Ontario and adjacent New York State, December 1971. *Amer. Birds* 27:839.
- Sokal, R.R. 1973. Introduction to biostatistics. Freeman and Company, San Francisco.



Eastern Kingbird

PHOTO: R.D. McRae